ELTEK VALERE
always on

THEIA™ HE-t

String Inverter ~ 2.0 - 4.4 kW_{AC}, 600 V_{DC}

INSTALLATION GUIDE

www.eltekvalere.com/renewable

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1. Product Overview

This *Installation Guide* contains all the necessary install information to connect and start up the *THEIA HE-t* inverter. The inverter must be used in compliance with the *THEIA HE-t User Guide,* which is to be found at *www.eltekvalere.com*.

1.1. Symbols Used

The warning symbols used in this *Installation Guide* highlight **important information** on how to avoid hazards to persons and equipment.

DANGER: Describes a hazard that poses an imminent risk of serious injury or death
WARNING: Describes a hazard that could result in serious injury or death, or could render equipment permanently inoperative
CAUTION: Describes a hazard that could result in personal injury or cause equipment damage
NOTICE: Describes a policy or standard that should be understood and followed

This symbol indicates that there is a potential for electric shock or electrocution

This symbol indicates an important safety note

Pay particular attention when the symbols appear in this *Installation Guide*!

1.2. Product Label

The product label is attached to the lower right side of the inverter housing. It contains important identification parameters and characteristics for the inverter, and must be clearly visible after installation.

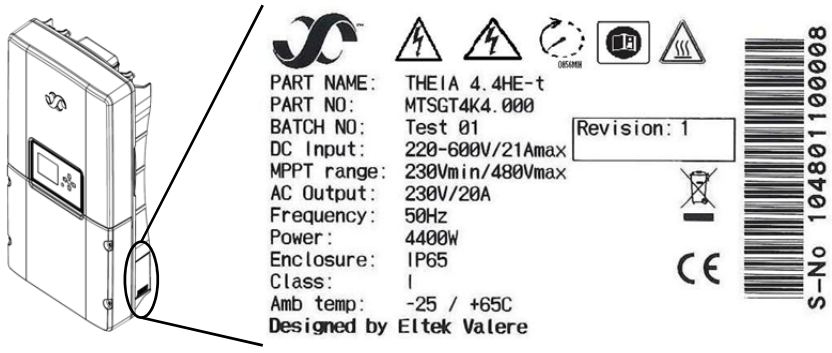


Figure 1.2.1: Product Label

Table 1.2.1: Symbols appearing on the product label

Symbol	Description
	Discharge time: High voltages are still present inside the inverter for 1 hour after switch OFF
	Refer to *User Guide*: Look for further details in the *User Guide*
	Hot Surface: The heat sink on the back of the inverter can reach temperatures up to 90 °C/194 °F
	Danger: High voltages are present
	Disposal: Do not dispose in general waste! Collect the various parts separately and recycle them according to local regulations
	CE Marking: The product meets the EU safety, health and environmental protection requirements
	S – NO: Serial Number for inverter identification

1.3. Unpacking and Inspection

After unpacking the inverter safely, check that all components are present and in an undamaged condition. If damaged, contact the *Eltek Valere* representative immediately.

1.3.1. Lifting and Carrying the Inverter

Considering the inverter's weight of **20-22 kg / 44-49 lbs.**, (depending upon model), lifting and carrying the inverter must be correctly performed to prevent back injuries.

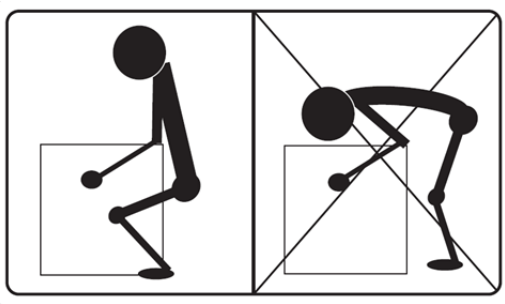


Figure 1.3.1: Correct lifting of the inverter

- When lifting, bend the knees, and keep the back straight.
- Lift carefully; hold the inverter close to the body and let the leg muscles do the work.
- Turn the whole body as one unit to avoid twisting the lower back.
- Carry the inverter close to the body.

1.3.2. Unpacking

Unpack the inverter as follows:

- Place the box in position, with the top clearly visible and according to the arrow marking on the packaging.
- Cut the seal, and open the box.
- Remove the upper part of the foam packing material.
- Take out the *Installation Guide* and the envelope with the extra product label.
- Both sides of the inverter case are narrowed in order to get a better grip on the inverter. Lift up the inverter carefully out of the box using the "handles" illustrated in *Figure 1.3.2*.
- Remove the lower section of the foam packaging and take out the inverter mounting bracket.
- The bag with accessories is attached to the bracket.
- Store all the original packing material for possible later use.

After unpacking the inverter safely, check that all components are present and in an undamaged condition.

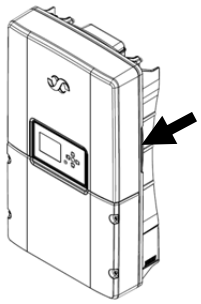


Figure 1.3.2: "Handles"

1.3.3. Scope of Delivery

- *THEIA HE-t* single phase inverter
- Mounting bracket
- Installation Guide
- Accessories: grounding strap, bracket screws, lock clip, extra product label

NOTICE

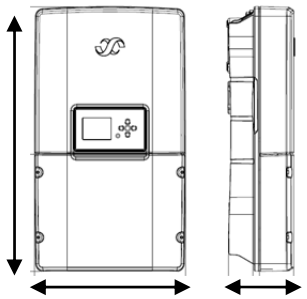
The mating parts of the connectors are not part of the standard scope of supply, and must be provided by the system installer.

1.3.4. Inverter Structure

The housing of the *THEIA HE-t* inverter is designed to:

- IP 65/NEMA 4X for indoor or outdoor use.
- Provide a degree of protection from dirt, rain, sleet, snow, dust, water, and corrosion.
- Be undamaged by the external formation of ice on the housing.

The inverter has the following dimensions:



H: 610 mm / 24.0 inches
W: 353 mm / 13.9 inches
D: 158 mm / 6.2 inches

Figure 1.3.3: Mechanical dimensions

The front surface of the inverter consists of an upper and a lower cover.

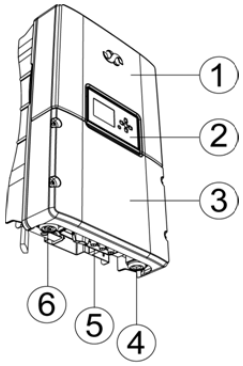


Figure 1.3.4: Inverter structure

1. Upper cover
2. Display
3. Lower cover; customer connection area
4. AC output
5. DC input
6. Network input

The upper cover may only be removed by *Eltek Valere* authorized personnel. Removal of the upper cover by unauthorized persons voids the warranty!
The lower cover protects the customer connection area, and may be removed by the system installer for electrical connection and maintenance of the inverter.

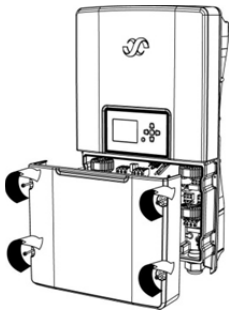


Figure 1.3.5: Lower cover

Removing the lower cover:
- Loosen the four screws on the lower cover with a 4 mm hex key, according to the figure.
- Take the cover off carefully.
- Store the lower cover and screws safely to avoid loss or damage.

Fastening the lower cover:
- Fasten the screws on the lower cover with a torque of 1.0 Nm / 0.74 ft-lbf.

DANGER: Always disconnect the power sources prior to removal of the lower cover!

The inverter is charged with high voltages, and removal of the lower cover can have lethal consequences if the inverter is not disconnected.

CAUTION: Never remove the lower inverter cover in wet conditions!

Removal of the lower inverter cover during rain or in damp conditions can damage sensitive internal electronic components.

2. Installation

Installation of the *THEIA HE-t* inverter shall be performed by **qualified installers** only, who have knowledge about the local and national electrical regulations in force.

DANGER: Only qualified persons may install the inverter!

Only persons who are qualified to install high voltage electrical equipment and are familiar with the electrical regulations applicable to the installation site may install the inverter. This is to ensure a safe installation and avoid electrocution!

Refer to *User Guide* for more detailed information about safety precautions regarding mechanical and electrical installation.

- The *THEIA HE-t* is a utility-interactive (grid-tie) inverter and must be used exclusively for its designed purpose, which is to convert PV-generated DC electricity into AC electricity to feed into the electricity network.

DANGER: Ensure correct installation and operation of the inverter!

The safety precautions and instructions in this *Installation Guide* must be read thoroughly to be able to install and operate the inverter properly to prevent death, injury or material damage.

2.1. Checks Prior to Installation

☑ Make sure that the AC circuit breaker(s) and the DC switch(es) are OFF and that the terminals are in a discharged state to prevent shock hazards.

DANGER: Contact with elive wires may cause lethal injuries!

All work on the inverter must be performed with disconnected terminals to avoid shock hazards!

☑ All electrical installations shall comply with the local and national electrical regulations in force in the country of installation.

☑ Check that the PV and the grid characteristics are compatible with the inverter characteristics (See *4. Technical Data*).

2.2. Mechanical Installation

Observe the following instructions when mounting and installing the *THEIA HE-t* inverter on a suitable site. This is crucial to maintaining the efficiency of the inverter!

WARNING: Ensure a suitable mounting surface!

Correct installation prevents the inverter from falling from the wall. The mounting surface must be suitable for the weight (20-22 kg / 44-49 lbs.) and temperature (90° C / 194° F) of the inverter.

CAUTION: Ensure a suitable installation site!

Protect the inverter from flammable and explosive environments, as the inverter heat sink can reach temperatures of up to 90° C / 194° F during long-periods of high performance operation.

- **Avoid enclosed areas with poor air flow!** Sufficient ventilation is needed to prevent temperature build up inside the inverter and hence possible power losses.

Observe the minimum distances specified below to maintain optimal cooling.

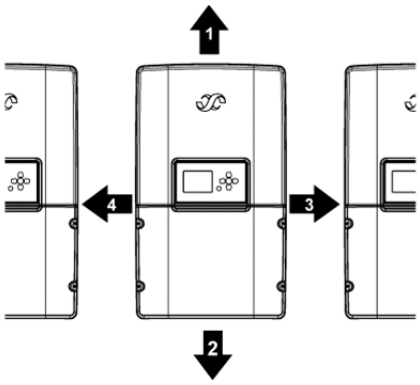


Figure 2.2.1: Minimum distances for optimum cooling

1. 400 mm / 15.75 inches
2. 300 mm / 11.81 inches
3. 150 mm / 5.91 inches
4. 150 mm / 5.91 inches

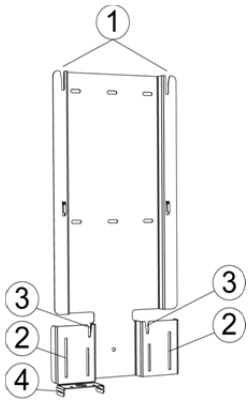
CAUTION: Avoid installations with direct exposure to sunlight!

Direct sunlight may cause yield losses; direct sunlight causes increased internal temperatures that can lead to reduced power output.

- For optimal operating conditions, the ambient temperature must be between -25° C & +65° C / -13° F & 149° F, and non-condensing relative humidity between 4 % and 99 %.

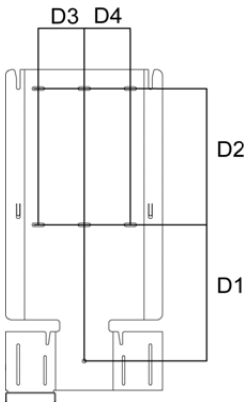
2.2.1. Wall Bracket

Depending on the mounting surface, different mounting methods may be required to secure the wall bracket. The system installer is responsible for selecting the correct type and number of fixings suitable to support the weight on the mounting surface. The bracket is designed to withstand 80 kg / 176.4 lbs.



1.
Carrier slots for the inverter
2.
Steering slots for the inverter
3.
Carrier slots for the stringbox
4.
Fixing clip

Figure 2.2.2: Inverter bracket



D1.
232.5 mm/9.2 inches
D2.
232.5 mm/9.2 inches
D3.
75 mm/2.95 inches
D4.
75 mm/2.95 inches

Figure 2.2.3: Distances between fixing screws

- The inverter must be mounted in a vertical position.
- Mark the mounting holes on the mounting surface using the bracket as a template and a spirit level.
- Fasten the bracket to the mounting surface with the required number of fixings to support the required hanging weight of the inverter.

2.2.2. Inverter

Attach the inverter to the mounting bracket as follows:

- Locate the hooks for the carrier slots on the upper back and the hooks for the steering slots on the lower back of the inverter.
- With string box included: Use the locating pins taps on the box.

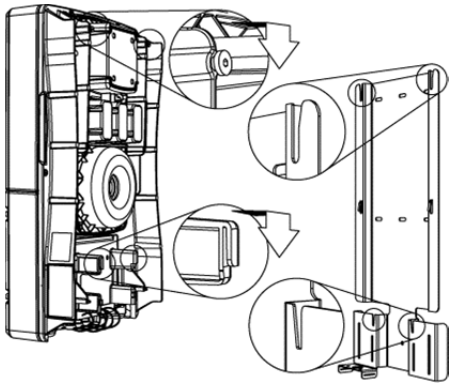


Figure 2.2.4: Hooks on the back of the inverter

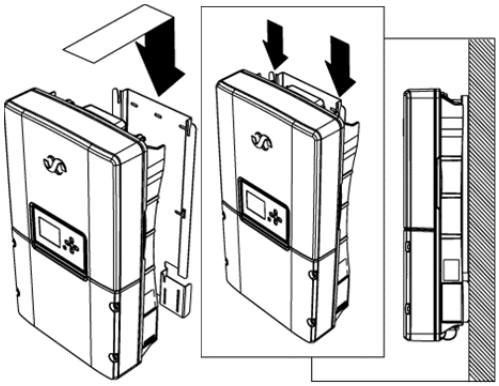


Figure 2.2.5: Inverter onto bracket

- Lift the inverter up and guide the upper hooks into the slots on the bracket.
- Control the lower hooks into the slots and slide the inverter onto the bracket.

- Ensure that the inverter is correctly mounted, and tighten the lock clip with one screw into the inverter and one into the string box (if present).
- Recommended torque is 1.0 Nm / 0.74 ft-lbf.

2.3. Electrical Installation

Correct electrical connection is critical for achieving a safe, long-term and reliable operation of the entire PV system.

DANGER: Never work with live wires!

All work on the inverter must be performed with disconnected terminals, as contact with live wires may cause serious injury or death!

DANGER: Ensure correct electrical connections!

Connection of the AC and DC side must be performed by qualified persons and comply with local and national electrical regulations and the instructions detailed in this *Installation Guide*.

- Ensure that the conductors and circuit breakers are properly sized to comply with the ratings of the circuits and the national electrical regulations to avoid possible damage.
- The conductors must be listed for PV applications and the site environment and have the correct color coding to avoid material damage and bodily harm.

2.3.1. Connection Area

The **DC connection** can be configured in three different ways; either by using a stringbox with fuse holders, a stringbox with no fuse holders or no string box.. The configuration of the **AC connections and the network connections** are the same regardless of the different DC connection options.

Prior to the electrical connection the lower inverter cover must be removed (See *1.3.3. Inverter Structure*).

2.3.1.1. Stringbox with DC Fuse Holders and DC Switch

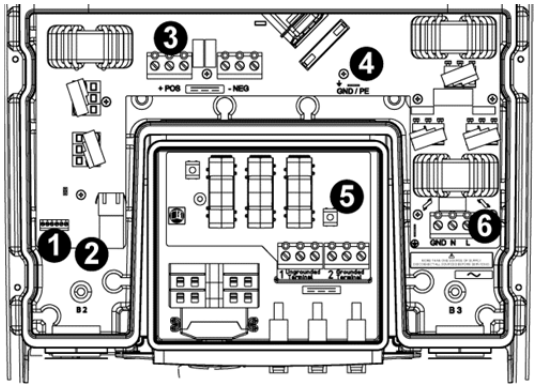


Figure 2.3.1: Stringbox with DC fuse holders and DC switch

1. CAN bus terminal
2. Ethernet connection
3. Internal DC terminal blocks
4. DC ground terminal
5. Stringbox with fuse holders and optional DC switch
6. AC terminal block

2.3.1.2. Stringbox with DC switch and no DC Fuse Holders

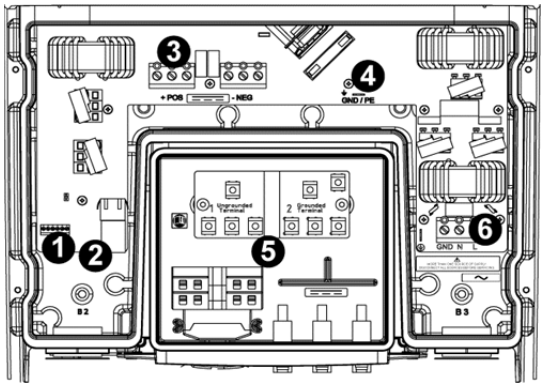


Figure 2.3.2: Stringbox with DC switch

1. CAN bus terminal
2. Ethernet connection
3. Internal DC terminal blocks
4. DC ground terminal
5. Stringbox with no fuse holders and DC switch
6. AC terminal block

2.3.1.3. Connector Panel

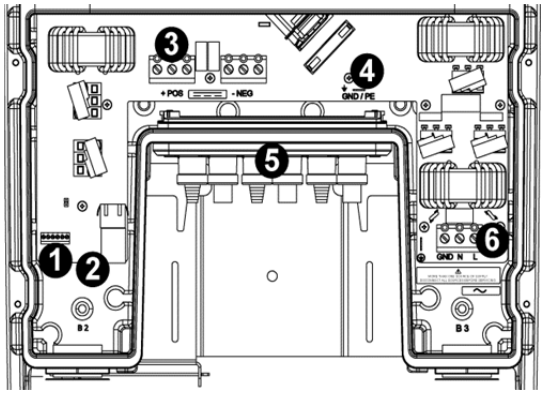


Figure 2.3.3: Connector panel

1. CAN bus terminal
2. Ethernet connection
3. Internal DC terminal blocks
4. DC ground terminal
5. Connector panel
6. AC terminal block

2.3.2. Grounding

Appropriate grounding of the entire PV system limits voltage surges, gives a common reference point for the conductive parts and facilitates the operation of the overcurrent devices. The *THEIA HE-t* inverters meet all relevant safety requirements and include internal surge protection.

DANGER: Ensure correct grounding of the inverter and the PV array!

Grounding must be carried out by qualified persons only and comply with local and national electrical regulations.

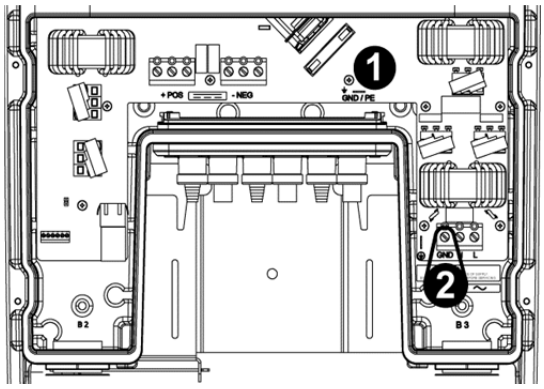


Figure 2.3.4: Ground terminals in the customer connection area

1. The ***DC ground terminal*** is located to the right of the – *NEG* terminal in the customer connection area and labeled ***GND/PE***.
2. The ***AC ground terminal*** is located in the lower right corner of the customer connection area and labeled ***GND***.

- Refer to the local and national electrical regulations for correct installation and sizing of grounding conductors.
- Only valid for France: According to *UTE C 15-712-1* a minimum cross section area of 6 mm² / 10 AWG is required for the earth wire connection.
- Follow the safety instructions and specifications from the different PV module manufacturers regarding grounding requirements.

CAUTION: Ensure correct grounding of the conductors!

The grounded PV conductors are grounded via the *DC ground terminal* and must **NOT** be grounded at any other point in the system, as voltage potentials can appear and possibly damage electrical components.

2.3.3. DC Side (PV) Connections

A PV string consists of a certain number of PV modules connected in series, which in turn can be connected in parallel and attached to the inverter.

DANGER: Disconnect the PV array before starting DC side connections!

Charged DC terminals pose a risk of serious injury or death as the PV array can supply up to 600 V_{DC} to the inverter when exposed to sunlight.

NOTICE

Maximum Voltage: The open circuit voltage, V_{OC}, must never exceed 600 V_{DC} under any conditions; the voltage generated by PV modules is inversely proportional to the temperature; at lower temperatures the PV voltage increases from the nameplate rating and at higher temperatures the PV voltage decreases from the nameplate rating.

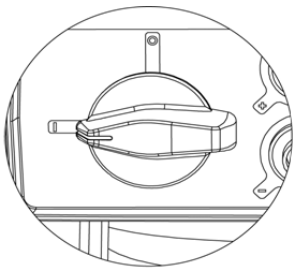
- The **grounding configuration** of the PV strings and the connection to the DC terminals depend on the module technology used and the local or national electrical regulations.
- The stringbox and is delivered from the factory in an **ungrounded PV string configuration** as standard, but may be configured for **positive or negative grounded PV strings**.
- The configuration of a **negative grounded PV string** differs from an ungrounded PV string with the addition of a grounding strap.
- The configuration of a **positive grounded PV string** differs from an ungrounded PV string with the connection to the DC terminal blocks and the addition of a grounding strap.
- **String configuration** depends on the module technology used. Due to the inverter having one MPP-tracker the number and type of PV modules, and hence the **PV power**, should be identical for every string.

2.3.3.1. Stringbox

The stringbox is attached to the bottom of the inverter, and provides PV string connection via plug-in connectors or cable glands. An optional DC switch can be mounted in the stringbox.

NOTICE

Ensure the DC switch, if supplied, is in the OFF position, when removing the lower cover to access the connection terminals.



0 = OFF
I = ON

Figure 2.3.5: Optional DC switch

There are three different configurations of the string box options:

1.Stringbox with DC fuse holders and DC switch
2.Stringbox with DC fuse holders and no DC switch
3.Stringbox with DC switch and no DC fuse holders

1. Stringbox with DC Fuse Holders and DC Switch

The stringbox can be equipped with DC fuse holders, DC switch and plug-in connectors or cable glands.

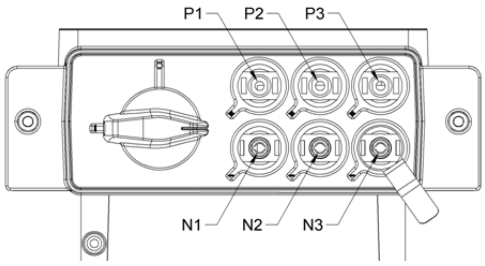


Figure 2.3.6: Optional DC connectors

P1, P2, P3: Positive connectors
N1, N2, N3: Negative connectors

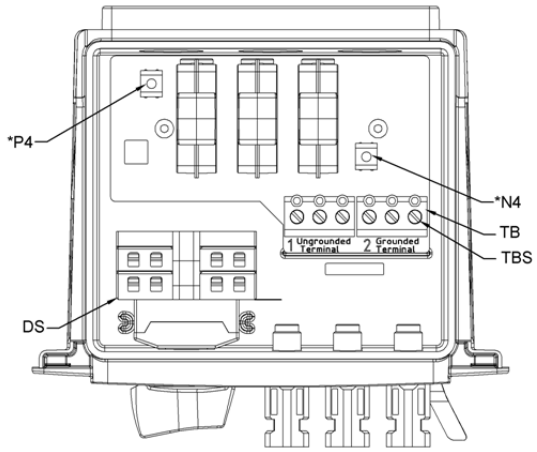


Figure 2.3.7: Stringbox with DC fuse holders and DC switch

***N4:** Grounding terminal and terminal for the grounding strap
***P4:** Ungrounded terminal

TB: Terminal Block
TBS: Terminal Block Screw
DS: DC Switch

Negative grounded PV String

- Connect the grounding strap between ***N4*** and the ***DC ground terminal*** in the internal connection area (See *2.3.2. Grounding*).

Positive grounded PV String

- Connect the positive conductors from the positive connectors to the terminal block labeled ***Grounded*** and the negative conductors to the terminal block labeled ***Ungrounded***.
- Switch the conductors connected to ***N4*** and ***P4***.
- Connect the grounding strap between ***N4*** and the ***DC ground terminal*** in the internal connection area (See *2.3.2. Grounding*).

2. Stringbox with DC Fuse Holders and no DC Switch

The stringbox can be equipped with DC fuse holders and plug-in connectors or cable glands and a blanking plug instead of the DC switch. A DC switch must be installed separately by authorized personnel in compliance with the relevant national electrical regulations.

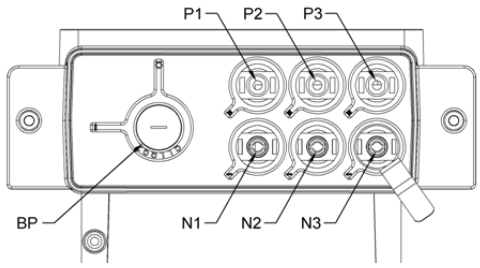


Figure 2.3.8: Optional DC connectors and no DC switch

P1, P2, P3: Positive connectors
N1, N2, N3: Negative connectors

BP: Blanking Plug

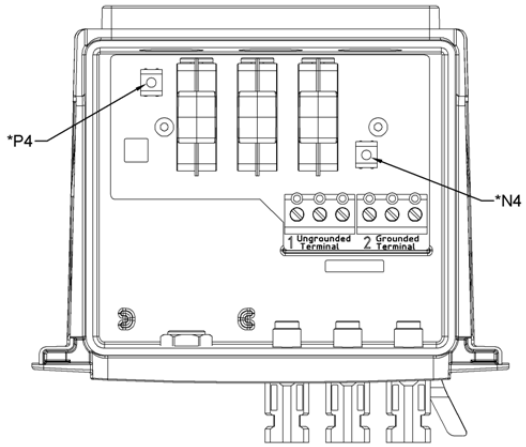


Figure 2.3.9: Stringbox with DC fuse holders and blanking plug

***N4:** Grounding terminal and terminal for the grounding strap
***P4:** Ungrounded terminal

Negative grounded PV String

- Connect the grounding strap between ****N4*** and the ***DC ground terminal*** in the internal connection area (See *2.3.2. Grounding*).

Positive grounded PV String

- Connect the positive conductors from the positive connectors to the terminal block labeled ***Grounded***, and the negative conductors to the terminal block labeled ***Ungrounded***.
- Switch the conductors connected to ****N4*** and ****P4***.
- Connect the grounding strap between ****N4*** and the ***DC ground terminal*** in the internal connection area (See *2.3.2. Grounding*).

3. Stringbox with DC Switch and no DC Fuse Holders

This option is a stringbox equipped with DC switch and plug-in connectors or cable glands, but there are no DC fuse holders.

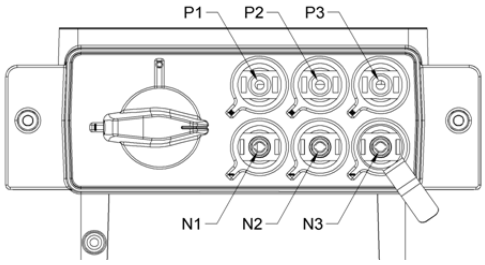


Figure 2.3.10: Optional DC connectors and DC switch

P1, P2, P3: Positive connectors
N1, N2, N3: Negative connectors

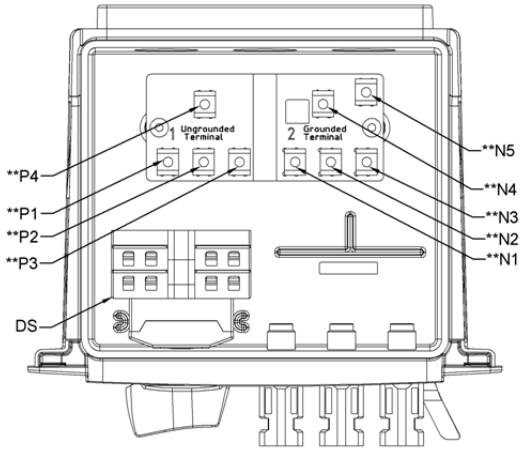


Figure 2.3.11: Stringbox with DC switch and no DC fuse holders

****P1**, ****P2**, ****P3:**
Terminals labeled *Ungrounded*
****N1**, ****N2**, ****N3:**
Terminals labeled *Grounded*

****N4:** Grounding terminal
****P4:** Ungrounded terminal
****N5:** Terminal for the grounding strap

DS: DC Switch

Negative grounded PV String

- Connect the grounding strap between *****N5*** and the ***DC ground terminal*** in the internal connection area (See *2.3.2. Grounding*).

Positive grounded PV String

- Connect the positive conductors from the positive connectors to the terminals *****N1***, *****N2*** and *****N3*,** and the negative conductors to the terminals *****P1***, *****P2*** and *****P3***.
- Switch the conductors connected to *****N4*** and *****P4***.
- Connect the grounding strap between *****N5*** and the ***DC ground terminal*** in the internal connection area (See *2.3.2. Grounding*).

2.3.3.2. No Stringbox: Connector Panel

The connector panel is equipped with plug-in connectors or cable glands. A DC switch must be installed separately by authorized personnel in compliance with the relevant national electrical regulations.

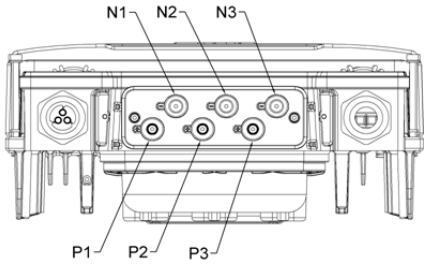


Figure 2.3.12: Connector panel with optional DC connectors

N1, N2, N3: Negative connectors
P1, P2, P3: Positive connectors

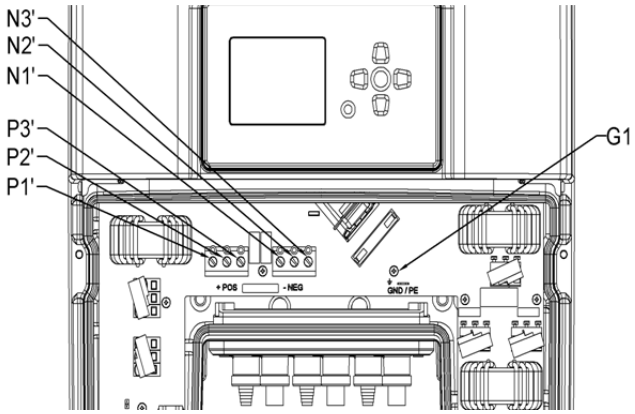


Figure 2.3.13: Customer connection area

P1', **P2'**, **P3':**
Terminals labeled *+POS* (Positive)
N1', N2', N3':
Terminals labeled *–NEG* (Negative)

G1: DC ground terminal (See *2.3.2. Grounding*)

Negative grounded PV String

- Connect the grounding strap between ***N3'*** and ***G1***.
- With three strings, two of the string conductors must be connected to the same terminal, so that the grounding strap has a terminal for itself.

Positive grounded PV String

- Connect the grounding strap between ***P3'*** and ***G1***.
- With three strings, two of the string conductors must be connected to the same terminal, so that the grounding strap has a terminal for itself.

2.3.3.3. Connection Procedures

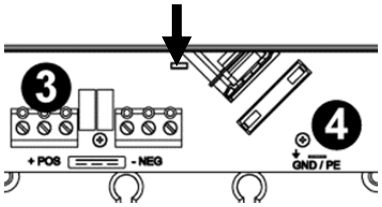
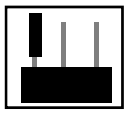
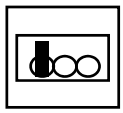
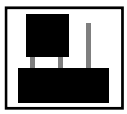
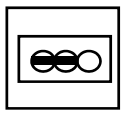
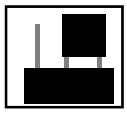
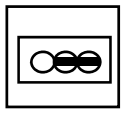
- The DC conductors connecting the PV array to the inverter must each have a minimum rating of 600Vdc at all given operating temperatures.
- The DC conductor cables must be sized for correct temperature rating and sunlight resistance. Use copper wire with a maximum cross-section area of between 6 to16 mm^2 / 10 to 6 AWG and temperature rating 90° C /194° F for all connections. Ensure compliance with the relevant national electrical regulations!
- Conductor insulation rating must be higher where the backs of the modules cannot receive cooling or where the ambient temperature exceeds 40° C. Note the relevant national electrical regulations!

String Connectors	Cable Glands
The corresponding mating connectors must be provided by the system installer. Follow the guidelines from the connector manufacturer when choosing cable sizes and assembling them in the connectors. Plug in the connectors and hand-tighten them to the corresponding connector on the inverter. Check if the contacts are firmly tightened by pulling them gently. **NOTICE** Only valid for France: Removal of the connectors requires a special tool. Note the relevant national electrical regulations!	Use cables with an overall diameter between 5 mm and 9 mm to be able to seal the gland locknut properly. Unscrew the gland locknut and guide the cables through the opening. Connect the conductors to the corresponding terminals in the stringbox / connection area according to the PV system grounding used. Tightening torque: • Terminal blocks: 1.5 Nm / 1.11 ft-lbf. • Ring terminals: 2.0 Nm / 1.48 ft-lbf. Pull the conductors gently to ensure that they are firmly tightened, and then tighten and seal the cable gland.

2.3.3.4. Jumper Position for the System Grounding Setup

The jumper above the - *NEG* terminal in the customer connection area monitors the arrangement of the DC connection according to the grounding setup. When delivered, the jumper is positioned for an ungrounded string. Depending on the requirements from the module manufacturer, the jumper must be pulled up and positioned correctly to match the grounding of the DC conductors.
In case of discrepancy a message will appear in the display: "*Fuse fault*".

Table 2.3.1: Jumper position for the grounding setup

Connection Area	From the side	From above	System
			**Ungrounded PV String** There is no connection between the pins.
			**Positive grounded PV String** The jumper short-circuits pin 1 and pin 2.
			**Negative grounded PV String** The jumper short-circuits pin 2 and pin 3.

2.3.4. AC Side (Grid) Connections

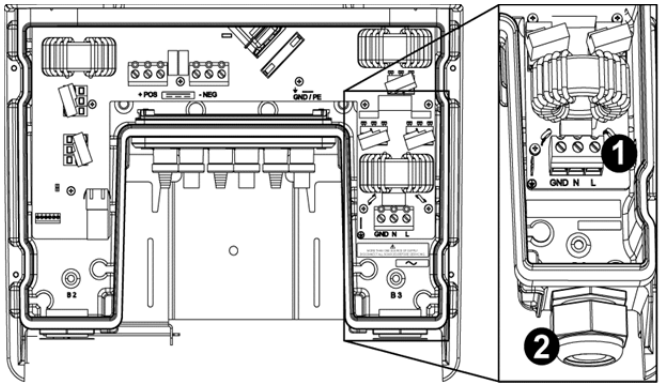
Verify that the AC grid specifications are compatible with the inverter characteristics before connecting the inverter to the grid:

- Single phase / Split phase
- Voltage range (184 – 276 V)
- Frequency range (50 Hz ±5 Hz)

DANGER: Ensure that the AC terminals are discharged!

Turn OFF the AC disconnector before connecting the inverter to the AC grid to avoid shock hazards.

2.3.4.1. Connection Procedures



1. AC terminal block:
- ***GND****:* Ground terminal
- ***N*****:** Neutral terminal (TN/TT) or Phase terminal (IT)
- ***L*****:** Phase terminal

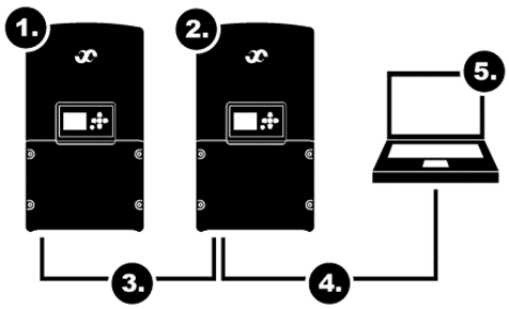
2. Cable gland

Figure 2.3.14: Customer connection area with AC terminals

- The AC conductors must be sized for the correct temperature and sunlight resistance. Use copper wire with a maximum cross-section area of 16 mm^2 / 6 AWG. Ensure compliance with the relevant national electrical regulations!
- The AC conductor resistance should be minimized.
- Unscrew the cable gland locknut.
- Guide the AC cable through the opening, and connect the conductors to the corresponding terminals in the connection area:
    - Phase conductor (L1 or L2 or L3) to ***L***
    - Neutral conductor (TN/TT) or Phase conductor (IT) to ***N***
    - Grounded conductor to ***GND***
- Tightening torque of the terminal screws is between 1.2-1.5 Nm / 0.89-1.11 lbft.
- Double check if the connection is correctly carried out.
- Hand-tighten the gland locknuts to seal the cable gland.

2.3.5. Network Connections

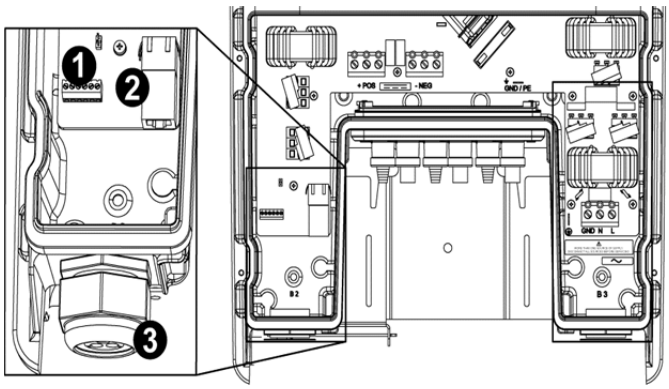
The inverter is equipped with two communication interfaces; Ethernet and CAN. **Ethernet** provides communication between the integrated web server and a computer, either directly or via a router/switch. **CAN** allows communication between several inverters.



1. Slave inverter
2. Master inverter
3. CAN bus
4. Ethernet
5. Computer

Figure 2.3.15: Network connections

2.3.5.1. Connection Procedures



1. CAN bus terminal
2. Ethernet connector
3. Network cable gland

Figure 2.3.16: Customer connection area with network terminals

NOTICE
If multiple inverters are connected together, all inverters must be connected to the CAN bus before *Start Up* to benefit from single installation setup.

- **Ethernet:** Use CAT5 or better, with size 0.21 mm^2 /24 AWG, with a maximum length of 100 m.
- **CAN:** Use a cable size 0.13 mm^2 / 26 AWG, with a maximum length of 100 m.
- Unscrew the network cable gland, and take out the grommet.
- Three-way cable gland insert:

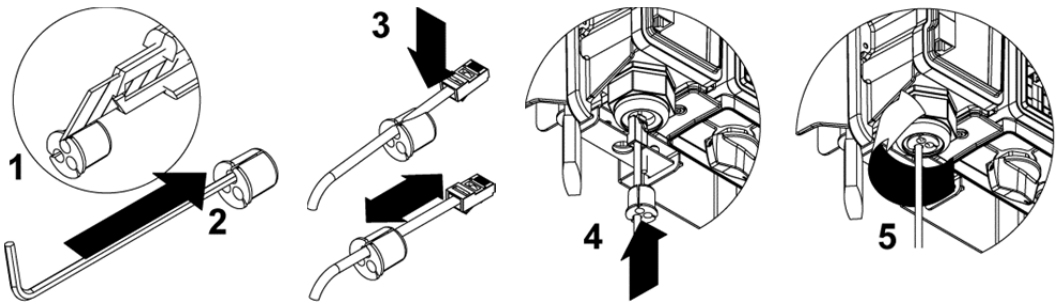


Figure 2.3.17: Insertion of the network cables in the cable gland

1. Conductors with connector: cut through the grommet with a width of about 1mm. With no connector: no cutting is necessary
2. Remove the plug from inside the grommet.
3. Assemble the cable in the gap. Repeat step 1 – 3 if more cables.
4. Guide the assembly into the cable gland.
Connect the cables to the terminals in the connection area as follows:

Ethernet	CAN
Plug the Ethernet cable directly into the RJ45 socket.	The conductors must be connected to the same labeled terminals at both ends, i.e. *H* connected to *H*, *L* to *L* etc. Recommended tightening torque is 0.2 Nm / 0.15ft-lbf.

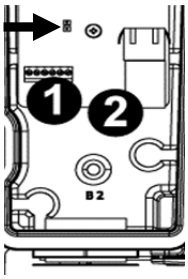
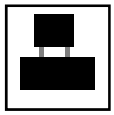
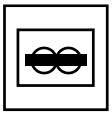
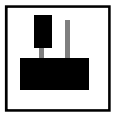
5. Tighten the cable gland firmly.

2.3.5.2. Jumper Position for Termination Resistance

With multiple inverters connected, the jumper located behind the CAN bus terminal activates the termination resistance when the pins are short-circuited, which minimizes signal reflections in the cables and avoids interference.

- **Single inverter:** The two pins must be short-circuited (*Default*).
- **Multiple inverters connected**: The master-slave configuration requires short-circuited pins on the first inverter and on the last inverter in the linked series. The pins must be disconnected on the inverters between the first and last inverters in the linked series.
- To disconnect the pins, the jumper must be pulled up and placed only on one of the pins.
- Be careful not to bend the pins when removing or installing the jumper!

Table 2.3.2: Jumper for multiple inverters in linked series

Connection Area	From the side	From above	Pins
			The pins are short-circuited.
			The pins are disconnected.

2.4. Safety Equipment Required for Grid Connected Systems

Safety equipment includes **switches or circuit breakers** to disconnect power sources, **fuses or circuit breakers** to protect conductors from overheating and **surge protection** to protect the equipment from voltage bursts and surges.

NOTICE

Safety Equipment: The system installer is responsible for providing safety equipment that meets the requirements for both the DC and AC operations to protect the equipment and prevent personal injury.

Refer to *User Guide* for detailed information about rating and installation of the safety equipment.

2.5. Checks before Start Up

- ☑ Check that the bracket and the inverter are correctly mounted and secured.
- ☑ Check that all terminals are correctly torqued, and that all connectors and cable glands are correctly tightened and sealed.
- ☑ Verify that the PV open-circuit voltage, V_{OC}, is below the limit of 600 V_{DC}, and that the polarity is correct.
- ☑ Verify that the conductors on the AC side are correctly connected to the AC terminal block.
- ☑ Ensure that no cables interfere with the sealing of the inverter lower cover, and fasten the cover firmly to the housing. Recommended tightening torque is 1.0 Nm / 0.74 ft-lbf.

3. Start Up

A minimum available voltage of 230 V_{DC} and a power of >7 W_{DC} is required before the inverter starts feeding power to the grid.

AC side
- Turn ON the AC circuit breaker(s).

DC side
- Turn ON the DC switch(es).

3.1. Initial Start

When the inverter is started for the first time, an installation menu is automatically displayed to enable the configuration of certain critical values and operational settings.

3.1.1. Customizing the Inverter Settings

Single Inverter
- When both the DC and the AC disconnectors are turned ON and the inverter is supplied with enough power, an installation menu is displayed in the LCD screen.

Multiple Connected Inverters
- Connect all inverters via the CAN bus so that configuring one inverter configures all inverters. The *Start Up* can then be carried out on any inverter, and when configured as the *master* inverter all the configuration settings of time, date, language and grid settings will be transferred to all the other inverters on the network (s*laves*).
- Each inverter is automatically assigned an ID number from the *master* during *Start Up*.

3.1.2. Display

The display on the front of the inverter contains a LCD screen, three LEDs and six function keys.

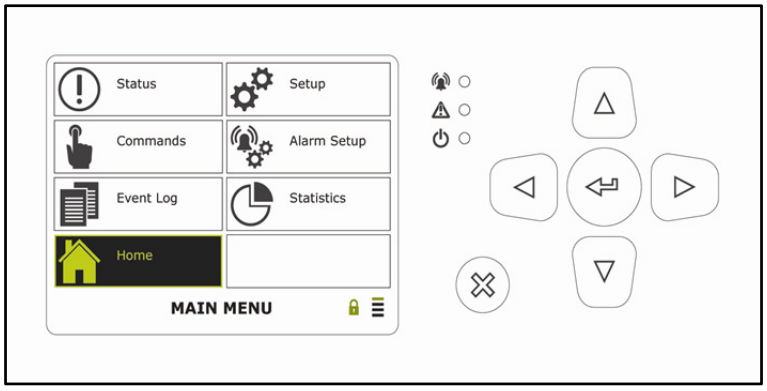


Figure 3.1.1: Inverter display

3.1.3. Function keys

The function keys have the following uses:

Table 3.1.1: Function keys

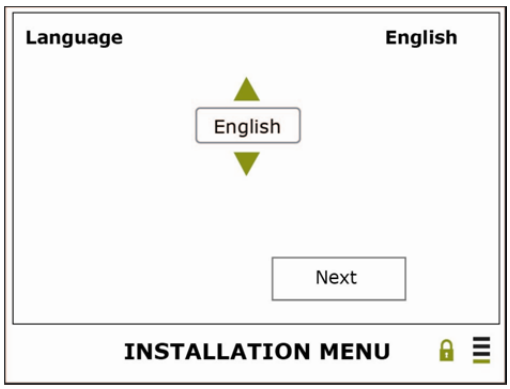
Symbol	Function	Symbol	Function
△	*Up*: Scroll up / increase value	▷	*Right:* Navigate one page or value right
▽	*Down:* Scroll down / decrease value	⏎	*Enter:* Select option / go to next level
◁	*Left:* Navigate one page or value left	✕	*Cancel:* Stop operation / back to previous menu item

- The selected item is always highlighted in yellow.
- A registered touch of a button causes a "*click*" sound to be heard.

3.1.3. Start Installation

Left – Cancel
Right – Ok
Enter – Confirm

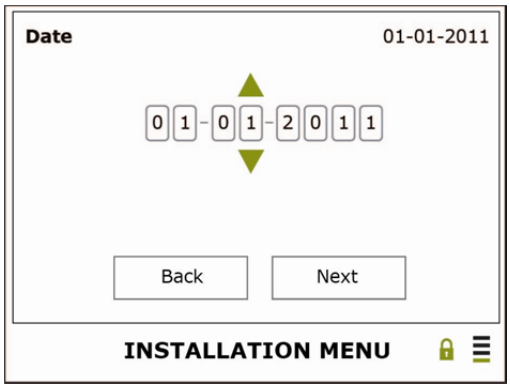
1. Language Selection



Default – English
Enter – Call up the list of languages ***Up*** or ***Down*** – Navigate through the list to find the preferred language
Enter – Confirm

Left – Next
Enter – Confirm

2. Date Adjustment

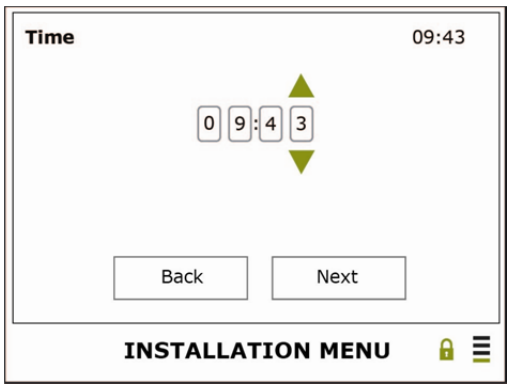


DD.MM.YYYY

Enter – Call up the date adjustment fields
Up – Increase present digit
Down - Decrease present digit
Right – Select next digit
Left – Select previous digit
Enter – Confirm

Left – Back
Right – Next
Enter – Confirm

3. Time Adjustment



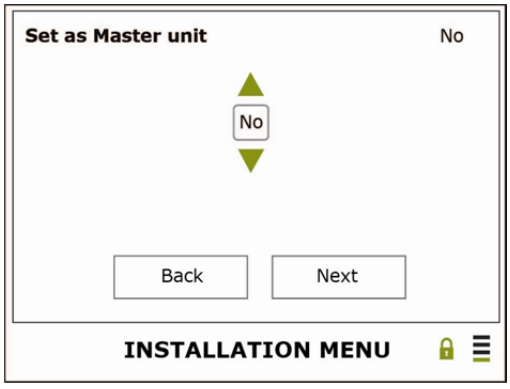
HH.MM (24 H)

Enter – Call up the time adjustment fields
Up – Increase present digit
Down – Decrease present digit
Right – Select next digit
Left – Select previous digit
Enter – Confirm

Left – Back
Right – Next
Enter – Confirm

NOTICE
The time setting must match the time on the actual installation site; otherwise data may be overwritten!

4. Set as Master Unit



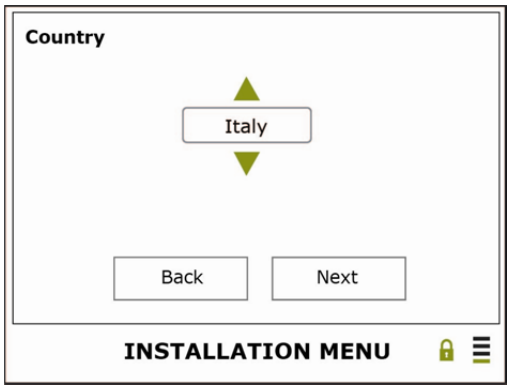
Default – No
Enter – Call up the options
Up – Yes
Down – No
Enter –Confirm

Left – Back
Right – Next
Enter – Confirm

5a. Country Settings

Enter – The question "*Change country settings?"* appears on the screen
Left – Cancel
Right –Ok
Enter – Confirm

5b. Country Settings



Enter – Call up the list of countries
Up or ***Down*** – Select the country of the actual installation site
Enter – Confirm

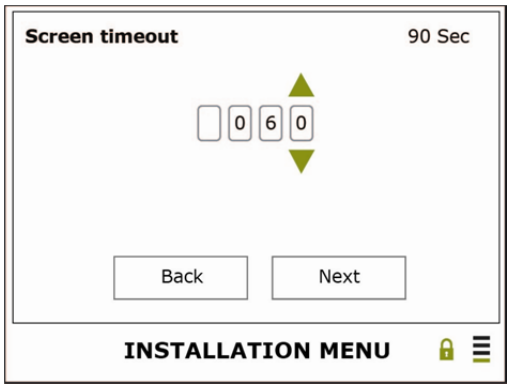
Left – Back
Right –Next
Enter – Confirm

NOTICE
An installation timer ensures that the country settings can be changed within the initial 5 hours of feeding power into the grid after installation. Thereafter it is only accessible using the *Installer* password, which may only be obtained for installers and grid operators by contacting *Eltek Valere*.

CAUTION: Ensure correct country settings!

The selected country must match the actual installation site; otherwise the inverter may not operate or be compliant to relevant national regulations due to incorrect limit values.

6. Screen Timeout



Enter – Call up the digits
Default – Screen backlight OFF after 60 sec
Up – Increase present digit
Down – Decrease present digit
Left – Select previous digit
Right – Select next digit

Left – Back
Right – Next
Enter – Confirm

NOTICE
The smallest value to be set is **30 sec**, and the highest is **99 sec**.
Setting the value to **0** disables the screen timeout and leaves the screen backlight ON.

7. Customer Name

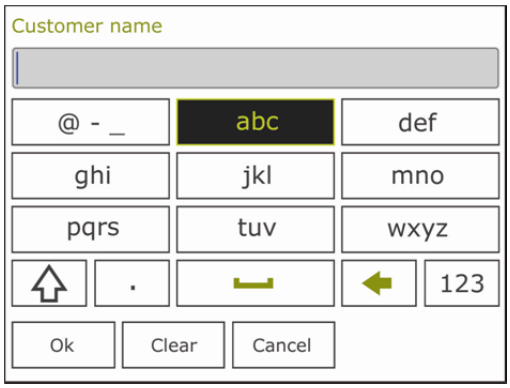
Enter – Call up the keyboard

The keyboard enables the typing of a customer name.

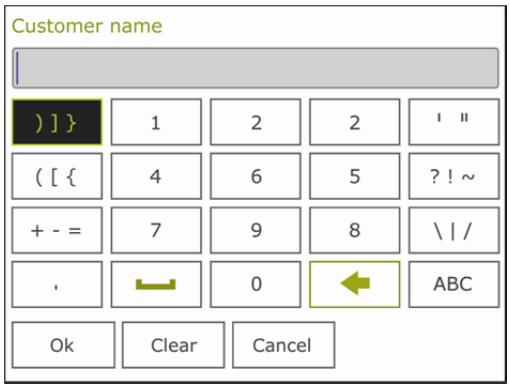
Left – Back
Right – Next
Enter – Confirm

In some of the submenus the settings must be typed by using the function keys:

Letter keyboard



Number keyboard



- *Enter* must be pressed until the wanted letter/number/symbol is shown.
- It is possible to navigate between the characters by using the *Up* arrow to set the marker into the text window, then using *Left* and *Right* to navigate between the characters.
- There is a maximum space for 19 symbols in the text window.

Symbol	Description	Symbol	Description
	Upper- or lower-case letter	Ok	Confirm changes and exit the menu
	Point	Clear	Clear the typing field
	Space	Cancel	Go back without saving changes
	Cancel last letter	ABC	Go to the Letter keyboard
123	Go to the Number keyboard		

8. Site

Enter – Call up the keyboard

The keyboard enables the typing of a site name.

Left – Back
Right – Next
Enter – Confirm

9. Message 1

Enter – Call up the keyboard

This message field is to help distinguish and identify specific inverters in a larger PV plant, or for any other information.

Left – Back
Right – Next
Enter – Confirm

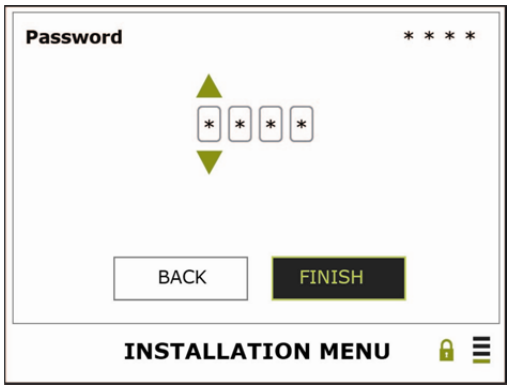
10. Message 2

Enter – Call up the keyboard

This message field is to help distinguish and identify specific inverters in a larger PV plant, or for any other information.

Left – Back
Right – Next
Enter – Confirm

11. Owner Password



Enter – Call up the digits
Default: 0003.
Change the password to 4 optional digits

Left – Back
Right – Finish
Enter – Confirm

This password is **not** transmitted to other inverters on the CAN bus

NOTICE

When several inverters are connected, check that the installation is carried out on all the slave inverters:

- Look at the menu displayed and the LEDs. Installation is **not** carried out correctly if the installation menu is still displayed and/or the yellow and red LEDs are lit.
- Check that the connection of the CAN cables are correct, that the DC switches are on and that the power is >7 W_{DC}.
- If the *Start Up* phase is correctly carried out, then the inverters are ready to use. They are fully automatic during normal operation, and no manual control is necessary for feeding power into the grid.

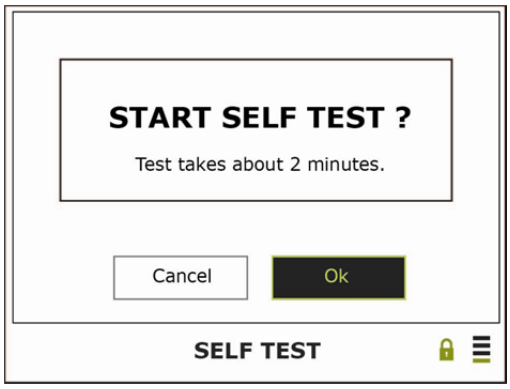
3.2. Self Test for Italy

The *Self Test* function is only valid for Italy. It tests the inverters' grid monitoring function of voltage and frequency, and takes approximately 2 minutes.

The Self-Test can only be activated when:

- The installation procedure is executed
- The country configuration is set to *Italy*
- The inverter is in *Running/Derating Mode*.

Select: *Commands>Inverter Commands>Self Test*



Left – Cancel
Right – Ok
Enter – Confirm

- The inverter carries out four test sequences, all of which are displayed on the screen.
- After the test is finalized, each test result must be confirmed by entering ***Next***.
- After entering ***Finish*** on the last result, the screen displays the *Inverter Commands* menu.
- The test results can be found in *Commands>Inverter Commands>Results Self Test.*

Refer to *User Guide* for more detailed information about the Italian *Self Test*.

4. Maintenance and Disposal

Regular inspection of the PV system is an important safety precaution to ensure trouble-free operation of the entire PV plant and the *THEIA HE-t* inverters. *Eltek Valere* is committed to its policy of environmental responsibility, and therefore appeals to end users who are disposing of inverters to follow local environmental legislation and to seek safe and responsible means of disposal.

4.1. Regular System Inspection

The *THEIA HE-t* inverters are designed and manufactured to operate trouble-free for many years. Performing regularly maintenance will ensure high efficiency and a longer service life for the inverters.

- Prior to service and maintenance work the inverter should always be disconnected on both the AC and the DC side and discharged to avoid shock hazards.
- The inverter needs 1 hour to discharge completely due to a capacitor bank inside the inverter.

Refer to *User Guide* for more detailed information about the discharge procedure of the capacitor bank.

CAUTION: The inverter upper cover must only be opened by qualified persons!

Unprotected internal components may be damaged! The inverter upper cover is to be opened only by *Eltek Valere* service persons or service partners authorized by *Eltek Valere* due to danger of damage to internal components and invalidated warranty.

Refer to *User Guide* for more detailed information about regularly maintenance of the inverter.

4.2. Return and Disposal

For return to *Eltek Valere* the inverter should always be in its original packaging or equivalent packaging. In case of return of the product as a result of inverter failure a form must be submitted to obtain a *Return Material Authorization* (*RMA*) number.

The form template can be found at: *www.eltekvalere.com/*

In case of return as a result of end of service life, the inverter can be returned to the *Eltek Valere* distributor or disposed of in the respective country. The shipping is paid by sender.

Recycling and disposal of the *THEIA HE-t* inverter must be done according to the rules and regulations applicable in the country of disposal. All material used for the packaging is recyclable.

5. Technical Data

INPUT DATA (PV SIDE)	*THEIA 2.0 HE-t*	*THEIA 2.9 HE-t*	*THEIA 3.8 HE-t*	*THEIA 4.4 HE-t*
Nominal DC power	2100 W	3000 W	4000 W	4600 W
Max recommended PV power	2625 W	3750 W	5000 W	5750 W
Max input current	9.5 A	13.5 A	18.0 A	21.0 A
Max DC voltage	600 V			
MPPT Range	230 – 480 V			
Number of PV string inputs	3			
Number of MPP trackers	1			
Input features	Reverse polarity protection Ground fault monitoring Integral DC switch (optional) Integral DC fuses for string inputs (optional) Field configurable for ungrounded, positive and negative grounded PV systems			
OUTPUT DATA (GRID SIDE)				
Nominal output power	2000 W	2900 W	3800 W	4400 W
Nominal output current	9.0 A	13.0 A	17.0 A	20.0 A
Max output current	10.5 A	15.2 A	19.7 A	23.0 A
AC voltage	184 – 276 V_{AC}, single or split phase			
Mains frequency	50 Hz ± 5 Hz			
Power Factor (cos φ)	1			
PERFORMANCE DATA				
Maximum efficiency	96.9 %	97.0 %	97.2 %	97.3 %
CEC efficiency	96.1 %	96.4 %	96.9 %	97.0 %
EU efficiency	96.0 %	96.2 %	96.6 %	96.9 %
Power feed starts at	< 7 W			
Night mode power	< 1 W			
MECHANICAL DATA				
Protection degree	IP 65 / NEMA 4X			
Dimensions	**H:** 610 mm / 24.03 inches **W:** 353 mm / 13.9 inches **D:** 158 mm / 6.22 inches (169,5 mm / 6.68 inches with bracket)			
Weight	19 kg / 42 lbs.	19 kg / 42lbs.	21 kg / 46 lbs.	21 kg / 46 lbs.
Cable access	Bottom			
Input cable connection	MC3, MC4, Tyco, screw terminals, cable gland, others on request			
Output cable connection	Screw terminals, cable gland			
DESIGN STANDARDS				
EM compatibility	EN 61000-6-2, EN 61000-6-3, FCC level B			
CE / UL marking	Yes			
Other standards	IEC 62109, IEC 61727, DIN VDE 0126, G83/1, EN 50438, AS 4777, ENEL Guidelines (DK 5940), RD 1663, EN 61000-3-2/11, EN 61000-3-3/12, UTE C 15-712-1, C10/11			
ENVIRONMENTAL DATA				
Operating temperature	-25 to +65 °C / -13 to +149 °F (Possible power derating above +45 °C / +113 °F)			
Storage temperature	-30 °C to +80 °C / -22 to +176 °F			
Ventilation	Convection cooling			
ADDITIONAL FEATURES				
Topology	High frequency transformer, galvanic isolation			
Noise emission	≤ 40 dB			
Communication	Graphical, color display with touch sense buttons, 3x LEDs for visual status indication, embedded web-server, Ethernet, CAN bus			
Warranty	5 years, 10 years, 15 years, 20 years options			

www.eltekvalere.com/renewable

ELTEK VALERE
always on